Overheating Assessment

158 Finchley Road, NW3 5HL

for

F&M (Investment Holdings) Ltd

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ISSUE

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1. INTRODUCTION

This report presents the results of the Overheating Assessment carried out for the proposed scheme at 158 Finchley Road in the London Borough of Camden. The risk of overheating in the main living areas of the building i.e. living rooms, kitchens and bedrooms has been assessed against the CIBSE TM59 (2017) overheating criteria.

2. THERMAL MODELLING

Thermal modelling has been carried out using IES Virtual Environment (Version 2016.0.1.0). IES software is approved by CIBSE AM11 'Building Energy and Environmental Modelling' (2015) to provide full dynamic thermal analysis. The IES model was based on drawings received from Flower Michelin Architects, including layouts, elevations and sections.

Figure 1 158 Finchley Road (Flower Michelin Architects)

The assessment has identified two sample dwellings that could experience a higher risk of overheating compared to the rest (please refer to Appendix A); a two-aspect dwelling on the 3rd floor and a deep-plan dwelling on the 4th floor with limited opportunities for natural cross ventilation and larger windows that receive higher solar gains. Since these two apartments are considered to be the worst-case scenarios, their performance should indicate any potential overheating risk for all the proposed apartments in the building.

3. TM59 OVERHEATING CRITERIA

CIBSE has recently published TM59 'Design methodology for the assessment of overheating risk in homes' (2017) to provide designers with a standardised approach to predict overheating risk for residential building designs using dynamic thermal analysis. The methodology provides a baseline for all domestic overheating risk assessments including studies for student accommodation, care homes etc.

All relevant rooms i.e. living rooms, kitchens and bedrooms should comply with the following two criteria for homes predominantly naturally ventilated. These have been assessed against the Category II (new buildings) acceptable temperature range, as defined in CIBSE TM52 guide.

Table 1 CIBSE TM59 Overheating criteria

Hours of exceedance (H_e) criteria for homes predominantly naturally ventilated	
Criterion 1	For living rooms, bedrooms and kitchens: the number of hours (H_e) during which ΔT, the difference between the actual operative temperature in the room at any time (T_{op}) and T_{max} the limiting maximum acceptable temperature, is greater than or equal to one degree (K) during the period May to September inclusive shall not be more than 3 per cent of occupied hours.
Criterion 2	For bedrooms only: to guarantee comfort during the sleeping hours the operative temperature in the bedroom from 10 pm to 7 am shall not exceed 26 °C for more than 1% of annual hours. (Note: 1% of the annual hours between 22:00 and 07:00 for bedrooms is 32 hours, so 33 or more hours above 26 °C will be recorded as a fail).

- Criterion 1 provides an understanding of how often a room is likely to exceed its comfort range during the summer months.
- Criterion 2 applies only to bedrooms and assess thermal comfort during night time.

4. MODELLING INPUT DATA

Building category	Category II	Normal expectation (for new buildings and renovations)

Weather Data	CIBSE future weather file	2020s London Heathrow LWC (central London) DSY1 (moderately warm summer) – High emissions scenario – 50th percentile

Building Envelope	Wall	0.18 W/m^{2}K
	Roof	0.13 W/m^{2}K
	Windows/ Glazed doors	1.30 W/m^{2}K - g-value: 0.61
	Shading devices	Internal shading devices i.e. blinds have not been taken into consideration.
	Air infiltration	0.25 ACH

Ventilation	Double/Single Bedroom	All bedrooms have mechanical supply ventilation (flow rate: 8 l/s). Tilt and turn type windows can be fully openable (at turn function) to provide additional air when both the internal dry bulb temperature exceeds 22^{o}C and the room is occupied. Internal doors can be fully openable to allow for natural cross ventilation through the dwelling, they are assumed to be closed when the occupants are sleeping i.e. from 11 pm to 8 am in accordance to our thermal model.
	Living room/Kitchen	All the rooms have mechanical supply and extract ventilation (flow rate: 13 l/s). When these are occupied, occupants can also control the windows based on the dry resultant Temperature i.e. fully open them when this exceeds 22oC. During the night, the windows, have been assumed to be left open during summer. Where sliding doors are proposed for ventilation, only half of the area has been assumed as openable in the model. Internal doors can be fully openable to allow for natural cross ventilation through the dwelling.

Internal gains: Occupancy (Based on CIBSE TM59 – Please refer to Table 2)	Heat Gains per person	75W – sensible gain 55W – latent gain
	Double Bedroom	2 people at 70% gains from 11 pm to 8 am 2 people at full gains from 8 am to 9 am and from 10 pm to 11 pm
	Single Bedroom	1 person at 70% gains from 11 pm to 8 am 1 person at full gains from 8 am to 11 pm

	Living room/Kitchen (2-bedroom apartment)	2 people from 9 am to 10 pm; room is unoccupied during the night

Internal gains: Lighting (Based on the CIBSE TM59 – Please refer to Table 2)	All rooms	2 W/sqm – Lights to be switched on between: 18:00-23:00 (it is assumed that in line with the energy strategy all lights are low energy/LED fittings)

Internal gains: Equipment load (Based on the CIBSE TM59 – Please refer to Table 2)	Double/Single Bedroom	Peak load of 80 W from 8 am to 11 pm Base load of 10 W during the sleeping hours
	Living room/Kitchen	Peak load of 450 W from 6 pm to 8 pm 200W from 8 pm to 10 pm 110 W from 9 am to 6 pm and from 10 pm to 12 pm Base load of 85 W for the rest of the day

Table 2 CIBSE TM59 (Occupacny-Equipment-Lighting) Heat gain profiles for various residential areas

Number of people	Description	Peak load (W) Sensible	Peak load (W) Latent	Period 00–01	01–02	02–03	03–04	04–05	05–06	06–07	07–08	08–09	09–10	10–11	11–12	12–13	13–14	14–15	15–16	16–17	17–18	18–19	19–20	20–21	21–22	22–23	23–24
				Hour-ending 1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00	17.00	18.00	19.00	20.00	21.00	22.00	23.00	24.00
1	Single bedroom occupancy	75	55	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7
2	Double bedroom occupancy	150	110	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1	0.7
2	Studio occupancy	150	110	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1-bed: living/kitchen occupancy	75	55	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0
1	1-bed: living occupancy	75	55	0	0	0	0	0	0	0	0	0	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0	0
1	1-bed: kitchen occupancy	75	55	0	0	0	0	0	0	0	0	0	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0	0
2	2-bed: living/kitchen occupancy	150	110	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0
2	2-bed: living occupancy	150	110	0	0	0	0	0	0	0	0	0	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0	0
2	2-bed: kitchen occupancy	150	110	0	0	0	0	0	0	0	0	0	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0	0
3	3-bed: living/kitchen occupancy	225	165	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0
3	3-bed: living occupancy	225	165	0	0	0	0	0	0	0	0	0	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0	0
3	3-bed: kitchen occupancy	225	165	0	0	0	0	0	0	0	0	0	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0	0
	Single bedroom equipment	80		0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.13
	Double bedroom equipment	80		0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.13
	Studio equipment	450		0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	1	1	0.44	0.44	0.24	0.24
	Living/kitchen equipment	450		0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	1	1	0.44	0.44	0.24	0.24
	Living equipment	150		0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	1	1	1	1	0.4	0.4
	Kitchen equipment	300		0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	1	1	0.17	0.17	0.17	0.17
	Lighting profile	2 (W/m2)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0

5. RESULTS ANALYSIS

The following table presents the results of the overheating analysis in terms of compliance with the TM59 criteria for the main living areas.

CIBSE TM59 Overheating Criteria – Detailed results			
Room	Criterion 1 (% Hrs Top-Tmax>=1K) ≤ 3%	Criterion 2 (No Hrs Tdr>26°C) ≤ 32 hrs	Complinace with TM59
03.Bedroom 11 (Double)	0.8	24	PASS
03.Bedroom 12 (Double)	0.8	18	PASS
03.Living Room/Kitchen 05/06	1.4	N/A	PASS
04.Bedroom 11 (Single)	0.8	18	PASS
04.Bedroom 12 (Double)	0.8	23	PASS
04.Living Room/Kitchen 05/06	2.4	N/A	PASS

Results show that all the assessed rooms meet the TM59 Criteria.

This study shows that the dwellings are not expected to experience a high risk of overheating as a result of the following measures that have been integrated in the design to ensure comfort during summer within the main living areas of each unit:

- Fully openable windows to allow for natural cross ventilation (following the ventilation strategy described above);
- windows will be of low g-value (of 0.61) to avoid heat transmittance during summer;
- additional flow rates can be provided through whole house mechanical ventilation, bypassing heat recovery where necessary, as a background system; and
- Within the residents/buyers guidance, tenants will be advised to purchase A-rated appliances of low energy consumption to reduce internal heat gains. Energy efficiency light fittings that emit less heat than standard types thus reducing overheating will be also specified.

6. CONCLUSION

The overheating analysis results presented above show that the main livng areas, i.e. living rooms, kitchens and bedrooms, of the assessed units, comply with the TM59 Criteria.The assessment is carried out on the basis of the detailed input data described in Section 4 of this report.

In real conditions occupants' behaviour, weather conditions, thermal performance of the building fabric, internal gains due to number of occupants, equipment installed and lighting as well as the ventilation strategy may differ from what has been assumed in the overheating assessment, such as the idealised occupant behaviour, described in Section 4 therefore having an impact on the occupants' thermal comfort. Results provide an indication of risk of overheating rather than an accurate prediction of absolute internal temperatures under operational conditions. Occupant perception of thermal comfort is a complex area which includes psychological factors such as expectation and physiological factors such as acclimatisation. No attempt has been made to quantify these in this analysis. This report therefore does not completely rule out the risk of overheating in the different zones of building, and the output of the model is only correct based on the various simplified assumptions mentioned in the report.

It is recommended that a guidance on how to tackle overheating is included in the home user guide for the future residents of these apartments; this should include the following:

- Ensure that efficient electric appliances will be used in the apartment. Don't leave any appliances or light on for longer than necessary specially during hot periods of summer. Don't leave the oven or hob on for longer than necessary.
- The apartment is provided with low energy light fitting, please ensure these will not be replaced by high energy efficient ones.
- During hot periods of summer:
    a. please ensure you will open the windows as soon as you feel it is getting warmer;
    b. Leave the windows open in the leaving room or if comfortable in the bedrooms during the nights
    c. When you feel the outside temperature is lower than inside, it would be sensible to leave your ventilation unit working on bypass mode to provide additional ventilation and remove the heat.
    d. Leave all internal doors open if the temperature is high to allow for cross ventilation
    e. During hot period of summers, it would be reasonable to close the curtains or use blinds to reduce the effect of direct radiation. However, these should be installed in such a way to prevent blocking incoming air.

APPENDIX A – ASSESSED RESIDENTIAL UNITS